

WHAT IS CLAIMED IS:

1. A car control unit loading an automatic transmission having a plurality of gears and a plurality of synchronizer capable of transferring torque from a drive power source to wheels via a friction clutch, an input shaft, and an output shaft and transferring said torque from said input shaft to said output shaft and having synchronizers capable of transferring said torque by friction to said plurality of synchronizer, said car control unit carrying out shifting by forming a torque transmission path from said input shaft to said output shaft by connection of said gears and said synchronizer, when switching said connection of said gears and said synchronizer from the first connection to the second connection, in a state that said friction clutch is engaged, by at least one synchronizer, transferring said torque of said drive power source from said input shaft to said output shaft, and switching a transfer path formed by said first connection to at least one intermediate transfer path formed by said synchronizer and then switching to a transfer path formed by said second connection, further comprising:

state discrimination means for detecting or inferring a state of a frictional surface of said

synchronizer and

synchronizer selecting means for selecting a synchronizer for forming said intermediate transfer path according to a parameter indicating said state of
5 said frictional surface detected or inferred by said state discrimination means.

2. A car control unit according to Claim 1, wherein

said parameter indicating said state of said
10 frictional surface detected or inferred by said state discrimination means is the temperature of said frictional surface of said synchronizer, or the heat quantity of said synchronizer, or the abrasion loss of the synchronizer and

15 said synchronizer selection means, when said parameter is larger than a predetermined value, selects at least two synchronizers forming said intermediate transfer path.

3. A car control unit loading an automatic
20 transmission having a plurality of gears and a plurality of synchronizer capable of transferring torque from a drive power source to wheels via a friction clutch, an input shaft, and an output shaft and transferring said torque from said input shaft to
25 said output shaft and having synchronizers capable of

transferring said torque by friction to said plurality
of synchronizer, said car control unit carrying out
shifting by forming a torque transmission path from
said input shaft to said output shaft by connection of
5 said gears and said synchronizer, when switching said
connection of said gears and said synchronizer from
the first connection to the second connection, in a
state that said friction clutch is engaged, by at
least one synchronizer, transferring said torque of
10 said drive power source from said input shaft to said
output shaft, and switching a transfer path formed by
said first connection to at least one intermediate
transfer path formed by said synchronizer and then
switching to a transfer path formed by said second
15 connection, further comprising:

state discrimination means for detecting or
inferring a state of a frictional surface of said
synchronizer and

drive power source torque control means for
20 reducing said torque of said drive power source
according to a parameter indicating said state
detected or inferred by said state discrimination
means.

4. A car control unit according to Claim 3,
25 wherein

said parameter indicating said state of said frictional surface detected or inferred by said state discrimination means is the temperature of said frictional surface of said synchronizer, or the heat
5 quantity of said synchronizer, or the abrasion loss of the synchronizer and

said drive power source torque control means, when said parameter is larger than a predetermined value, reduces said torque of said drive power source.

10 5. A car control unit loading an automatic transmission having a plurality of gears and a plurality of synchronizer capable of transferring torque from a drive power source to wheels via a friction clutch, an input shaft, and an output shaft
15 and transferring said torque from said input shaft to said output shaft and having synchronizers capable of transferring said torque by friction to said plurality of synchronizer, said car control unit having a first mode for carrying out shifting by forming a torque
20 transmission path from said input shaft to said output shaft by connection of said gears and said synchronizer, when switching said connection of said gears and said synchronizer from the first connection to the second connection, in a state that said
25 friction clutch is engaged, by at least one

synchronizer, transferring said torque of said drive power source from said input shaft to said output shaft, and switching a transfer path formed by said first connection to at least one intermediate transfer path formed by said synchronizer and then switching to a transfer path formed by said second connection and a second mode for carrying out shifting by, when switching said connection of said gears and said synchronizer from the first connection to the second connection, in a state that said friction clutch is engaged, switching a transfer path formed by said first connection to a transfer path formed by said second connection, further comprising:

state discrimination means for detecting or inferring a state of a frictional surface of said synchronizer and

shift mode switching means for switching said first shift mode and said second shift mode according to a parameter indicating said state of said frictional surface detected or inferred by said state discrimination means.

6. A car control unit according to Claim 5, wherein:

said parameter indicating said state of said frictional surface detected or inferred by said state

discrimination means is the temperature of said frictional surface of said synchronizer, or the heat quantity of said synchronizer, or the abrasion loss of the synchronizer and

5 said drive power source torque control means, when said parameter is larger than a predetermined value, switches said second shift mode.

7. A car control unit loading an automatic transmission having a plurality of gears and a
10 plurality of synchronizer capable of transferring torque from a drive power source to wheels via a friction clutch, an input shaft, and an output shaft and transferring said torque from said input shaft to said output shaft and having synchronizers capable of
15 transferring said torque by friction to said plurality of synchronizer, said car control unit having a first mode for carrying out shifting by forming a torque transmission path from said input shaft to said output shaft by connection of said gears and said
20 synchronizer, when switching said connection of said gears and said synchronizer from the first connection to the second connection, in a state that said friction clutch is engaged, by at least one synchronizer, transferring said torque of said drive
25 power source from said input shaft to said output

shaft, and switching a transfer path formed by said first connection to at least one intermediate transfer path formed by said synchronizer and then switching to a transfer path formed by said second connection and a second mode for carrying out shifting by, when switching said connection of said gears and said synchronizer from the first connection to the second connection, in a state that said friction clutch is engaged, switching a transfer path formed by said first connection to a transfer path formed by said second connection, further comprising:

state discrimination means for detecting or inferring a state of a frictional surface of said synchronizer,

drive power source torque control means for reducing said torque of said drive power source according to a parameter indicating said state detected or inferred by said state discrimination means, and

shift mode switching means for switching said first shift mode and said second shift mode according to a parameter indicating said state of said frictional surface detected or inferred by said state discrimination means.

8. A car control unit according to Claim 7,

wherein

said parameter indicating said state of said frictional surface detected or inferred by said state discrimination means is the temperature of said frictional surface of said synchronizer, or the heat
5 quantity of said synchronizer, or the abrasion loss of the synchronizer,

said drive power source torque control means, when said parameter is smaller than a predetermined value,
10 reduces said torque of said drive power source in said first shift mode, and

said drive power source torque control means, when said parameter is larger than said predetermined value, switches said second shift mode.

15 9. A car control method loading an automatic transmission having a plurality of gears and a plurality of synchronizer capable of transferring torque from a drive power source to wheels via a friction clutch, an input shaft, and an output shaft
20 and transferring said torque from said input shaft to said output shaft and having synchronizers capable of transferring said torque by friction to said plurality of synchronizer, said car control method carrying out shifting by forming a torque transmission path from
25 said input shaft to said output shaft by connection of

said gears and said synchronizer, when switching said connection of said gears and said synchronizer from the first connection to the second connection, in a state that said friction clutch is engaged, by at least one synchronizer, transferring said torque of said drive power source from said input shaft to said output shaft, and switching a transfer path formed by said first connection to at least one intermediate transfer path formed by said synchronizer and then switching to a transfer path formed by said second connection, comprising the step of:

detecting or inferring a state of a frictional surface of said synchronizer and selecting a synchronizer for forming said intermediate transfer path according to a parameter indicating said detected or inferred state.

10. A car control method loading an automatic transmission having a plurality of gears and a plurality of synchronizer capable of transferring torque from a drive power source to wheels via a friction clutch, an input shaft, and an output shaft and transferring said torque from said input shaft to said output shaft and having synchronizers capable of transferring said torque by friction to said plurality of synchronizer, said car control method carrying out

shifting by forming a torque transmission path from
said input shaft to said output shaft by connection of
said gears and said synchronizer, when switching said
connection of said gears and said synchronizer from
5 the first connection to the second connection, in a
state that said friction clutch is engaged, by at
least one synchronizer, transferring said torque of
said drive power source from said input shaft to said
output shaft, and switching a transfer path formed by
10 said first connection to at least one intermediate
transfer path formed by said synchronizer and then
switching to a transfer path formed by said second
connection, comprising the step of:

detecting or inferring a state of a frictional
15 surface of said synchronizer and reducing said torque
of said drive power source according to a parameter
indicating said detected or inferred state.

11. A car control method loading an automatic
transmission having a plurality of gears and a
20 plurality of synchronizer capable of transferring
torque from a drive power source to wheels via a
friction clutch, an input shaft, and an output shaft
and transferring said torque from said input shaft to
said output shaft and having synchronizers capable of
25 transferring said torque by friction to said plurality

of synchronizer, said car control method having a first mode for carrying out shifting by forming a torque transmission path from said input shaft to said output shaft by connection of said gears and said synchronizer, when switching said connection of said gears and said synchronizer from the first connection to the second connection, in a state that said friction clutch is engaged, by at least one synchronizer, transferring said torque of said drive power source from said input shaft to said output shaft, and switching a transfer path formed by said first connection to at least one intermediate transfer path formed by said synchronizer and then switching to a transfer path formed by said second connection and a second mode for carrying out shifting by, when switching said connection of said gears and said synchronizer from the first connection to the second connection, in a state that said friction clutch is engaged, switching a transfer path formed by said first connection to a transfer path formed by said second connection, comprising the step of:

detecting or inferring a state of a frictional surface of said synchronizer and switching said first shift mode and said second shift mode according to a parameter indicating said detected or inferred state.

12. A car control method loading an automatic transmission having a plurality of gears and a plurality of synchronizer capable of transferring torque from a drive power source to wheels via a friction clutch, an input shaft, and an output shaft and transferring said torque from said input shaft to said output shaft and having synchronizers capable of transferring said torque by friction to said plurality of synchronizer, said car control method having a first mode for carrying out shifting by forming a torque transmission path from said input shaft to said output shaft by connection of said gears and said synchronizer, when switching said connection of said gears and said synchronizer from the first connection to the second connection, in a state that said friction clutch is engaged, by at least one synchronizer, transferring said torque of said drive power source from said input shaft to said output shaft, and switching a transfer path formed by said first connection to at least one intermediate transfer path formed by said synchronizer and then switching to a transfer path formed by said second connection and a second mode for carrying out shifting by, when switching said connection of said gears and said synchronizer from the first connection to the second

connection, in a state that said friction clutch is engaged, switching a transfer path formed by said first connection to a transfer path formed by said second connection, comprising the step of:

- 5 detecting or inferring a state of a frictional surface of said synchronizer and reducing said torque of said drive power source according to a parameter indicating said detected or inferred state or switching said first shift mode and said second shift
- 10 mode according to a parameter indicating said detected or inferred state.